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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/544,270	Applicant(s) HARTOG, ARTHUR H.	
	Examiner MICHAEL LAPAGE	**Art Unit** 2886	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *25 April 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *See Continuation Sheet* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-6,10-12,14-16,19-22,26,28-30,35,36,39,42-44,48-50,52-54,57-60,64,66-74 and 77.* is/are rejected.

7)☒ Claim(s) *2 and 40* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Continuation of Disposition of Claims: Claims pending in the application are 1,4-6,10-12,14-16,19-22,26,28-30,35,36,39,42-44,48-50,52-54,57-60,64,66-74 and 77.

DETAILED ACTION

1. Claims 1-77 are presented for examination.

2. Claims 1-2, 4-6, 10-12, 14-16, 19-22, 26, 28-30, 35-36, 39-40, 42-44, 48-50, 52-54, 57-60, 64, 66-74, and 77 are pending before the United States Patent Office.

3. Claims 3, 7-9, 13, 17-18, 23-25, 27, 31-34, 37-38, 41, 45-47, 51, 55-56, 61-63, 65, 75-76 are made of record as being canceled by applicant in preliminary amendment.

Claim Objections

4. Claim 35, 73, and 77 recite the limitation "the cross-talk term" in line 2 of claims 35 and 73, and line 6 of claim 77.

5. Claim 35, 73, and 77 recite the limitation "the measured second sensor element phasor" in line 6 of claims 35 and 73, and line 10 of claim 77.

There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 112

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claims 35, 73 and 77 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are: The cross-talk phasor detection is not enabled due to the lack of steps missing that explain how the cross-talk phasor is being detected or mathematically calculated from the optical interference signal. Further it appears that the steps are lacking for detecting an nth

sensor element phasor and also a cross talk nth sensor element phasor and subtracting the two phasors from each other.

8. Claims 35, 73 and 77 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

As to claims 35, 73, and 77 it is unclear to the examiner how the cross-talk nth sensor element phasor is being detected and then further how it is subtracted from a measured nth sensor element phasor. Further the claim is unclear how the first cross-talk phasor is being detected and then set to a value of zero. The examiner is unclear on how to interpret the claim for a rejection based on prior art. Also, at the same time, the examiner is unable to point out whether these claims contain allowable subject matter or not.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

10. Claims 1 and 39 are rejected under 35 U.S.C. 102(e) as being anticipated by Waagaard (U.S. Patent No. 7,019,837).

As to claim 1, Waagaard discloses a method of measuring at least one selected parameter at a location within a region of interest, which method comprises the steps of:

launching optical pulses at a plurality of preselected interrogation wavelengths (i.e. multiplexed pulses implicitly requires multiple wavelengths, additionally the can be Fiber Bragg grating reflectors which inherently reflect different wavelength light dependent upon design) into an optical fiber deployed along the region of interest, reflectors (i.e. Fabry-Perot sensor arrays) being arrayed along the optical fiber to form an array of sensor elements, the optical path length between the said reflectors being dependent upon the selected parameter (i.e. physical attributes such as strain or chemical attributes such as temperature) (col. 1, lines 23-29, and lines 58-67; col. 7, line 66 thru col. 8 line 5);

detecting the returned optical interference signal (i.e. where inherently there signal is interference based when using a Fabry-Perot sensor element array) for each of the preselected wavelengths (col. 3, lines 50-56); and

determining from the optical interference signal the absolute optical path length (i.e. which is a direct function of the optical phase delay detected in the inference detection, further in a Fabry-Perot optical reflector systems the interference being measured is a direct result of the optical path length being influenced between the two reflectors) between two reflectors at the said location, and from the optical path length so determined the value of the selected parameter at the said location (col. 4, lines 13-16; where though not explicitly disclosed the interference detection is used to determine the desired selected parameter).

As to claim 39, Waagaard discloses and shows in figure 1, an apparatus for measuring a selected physical parameter at a location within a region of interest, which apparatus comprises:

an optical fiber (102) for deployment along the region of interest, the optical fiber having reflectors therealong forming an array of sensor elements (i.e. Fabry-Perot sensor arrays), the optical path length between the said reflectors being dependent upon the selected parameter (i.e. as the reflectors move due to strain they change the optical path length) (col. 1, lines 23-29, and lines 58-67);

source means (104) operable to launch optical pulses at a plurality of preselected interrogation wavelengths (i.e. where the wavelengths would be preselected in order to properly detect and correlate the data being returned from each Fiber Bragg Grating) into the said fiber (col. 3, lines 50-56; col. 4, lines 9-13; col. 7, line 66 thru col. 8 line 5);

signal detection means (106) operable to detect the returned optical interference signal for each of the preselected wavelengths (col. 3, lines 50-56; col. 4, lines 15-18; where the detection can be based on many wavelengths present within the fiber); and

signal processing means operable to determine from the optical interference signal the absolute optical path length (i.e. which is a direct function of the optical phase delay detected in the inference detection) between two reflectors at the said location and to determine from the optical path length so determined the value of the selected parameter at the said location (col. 4, lines 13-16; where though not explicitly disclosed the interference detection is used to determine the desired selected parameter).

Claim Rejections - 35 USC § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 4-6, 10-12, 14-16, 19-21, 26, 28-30, 36, 43-44, 48-50, 52-54, 57-59, 60, 64, 66-69, 72, and 74 are rejected under 35 U.S.C. 103(a) as being unpatentable over Waagaard in view of Prohaska et al (U.S. Patent No. 6,208,776 B1 and Prohaska hereinafter).

Although the system discloses in Waagaard shows substantial features of the claimed invention (discussed in paragraphs above), it fails to disclose:

A method where the optical fiber comprises polarisation-maintaining fiber and light is launched into the fiber in such a way that the power of the light signal is firstly directed entirely into one of the principal states of polarizationand then the other, thereby to interrogate the principal states of polarization sequentially, the returned interference signals from both principal states of polarization being used separately in the said process for determining the absolute optical path length for each propagation mode independent of the other mode [claim 5].

A method in which the selected parameter comprises temperature [claim 6].

A method in which the selected parameter comprises strain [claim 10].

A method where the optical fiber is a high-birefringence fiber, the birefringence of which changes in response to strain applied to the optical fiber [claim 11].

A method where the birefringence of the high-birefringence fiber also changes in response to temperature, and the method further comprises compensating the returned optical interference signal for effects arising from temperature at the said location [claim 12].

A method in which the selected parameter comprises pressure [claim 14].

A method where the said optical fiber comprises a side-hole fiber [claim 15].

A method where each sensor element of the fiber is located within a sealed elliptical tube filled with a pressure-transmitting fluid [claim 16].

A method where the selected parameter depends on a localized event moving along the region of interest, and the method comprises determining the value of the selected parameter over time at more than one said location, and determining the movement of the localized event from the determined values of the selected parameter [claim 19].

A method where the localized event is a user-induced event, and the method further comprises inducing the localized event [claim 20].

A method as where the localized event is a volume of fluid within the region of interest that has a different temperature, pressure, or density from surrounding fluid in the region of interest, the selected parameter being temperature, pressure, or density, respectively [claim 21].

A method where the measured value for the parameter is used to determine the value for a further measurand dependent upon the said parameter and where the said

optical fiber is provided with a coating which responds to the said further measurand by stretching or shrinking [claim 26].

A method where the said coating is electro-strictive [claim 28].

A method where the said coating is magneto-strictive [claim 29].

A method where the said coating is sensitive to a selected chemical measurand [claim 30].

A method where the region of interest lies within an oil well [claim 36].

An apparatus where the said optical fiber comprises polarisation-maintaining fiber, and the apparatus further comprises a polarization modulator operable to launch the optical pulses into the fiber in such a way that the power of the optical pulses is firstly directed entirely into one of the principal states of polarization of the fiber and then the other, thereby to interrogate the principal states of polarization sequentially; and the signal processing means being operable to use the returned optical interference signals from both principal states of polarization separately to determine the absolute optical path length for each propagation mode independent of the other mode [claim 43].

An apparatus where the parameter comprises temperature [claim 44].

An apparatus where the parameter comprises strain [claim 48].

An apparatus where the optical fiber is a high-birefringence fiber, the birefringence of which changes in response to strain applied to the optical fiber [claim 49].

An apparatus where the birefringence of the high birefringence fiber also changes in response to temperature, and the signal processing means is further

operable to compensate the returned optical interference signal for effects arising from temperature at the said location [claim 50].

An apparatus where the parameter comprises pressure [claim 52].

An apparatus where the said optical fiber comprises a side-hole fiber [claim 53].

An apparatus where each sensor element of the fiber is located within a sealed elliptical tube filled with a pressure-transmitting fluid [claim 54].

An apparatus where the selected parameter depends on a localized event moving along the region of interest, and the signal processing means is operable to determine the value of the selected parameter over time at more than one said location, and to determine the movement of the localized event from the determined values of the selected parameter [claim 57].

An apparatus where the localized event is a user-induced event [claim 58].

An apparatus where the localized event is a volume of fluid within the region of interest that has a different temperature, pressure, or density from surrounding fluid in the region of interest, the selected parameter being temperature, pressure, or density, respectively [claim 59].

An apparatus further for measuring a second selected physical parameter at the location within the region of interest, where said optical path length between the said reflectors is further dependent upon the second selected parameter; and the signal processing means is further operable to determine the value of the second selected physical parameter from the determined absolute optical path length [claim 60].

An apparatus operable to use the measured value for the parameter to determine a value for a further measured dependent upon said parameter, and where the said optical fiber is provided with a coating which responds to the said further measured by stretching or shrinking [claim 64].

An apparatus where the said coating is electro-astrictive [claim 66].

An apparatus where the said coating is magneto-astrictive [claim 67].

An apparatus where the coating is designed to be sensitive to a selected chemical measured [claim 68].

An apparatus where the source means are operable to launch light at a fixed wavelength and at a varying wavelength into the fiber, and the signal processing means are operable to use the interference signal from interrogation at the fixed wavelength to determine high frequency phase changes [claim 69].

An apparatus where the signal processing means are further operable to use the high frequency phase changes to correct for dynamic errors in the returned optical interference signals [claim 72].

An apparatus where the region of interest lies within an oil well [claim 74].

Nonetheless, these features are well known in the art and would have been obvious modifications of the method and apparatus disclosed in Waagaard, as evidenced by Prohaska.

As to claim 5, Prohaska discloses a method where the optical fiber comprises polarisation-maintaining fiber and light is launched into the fiber in such a way that the power of the light signal is firstly directed entirely into one of the principal states of

polarizationand then the other, thereby to interrogate the principal states of polarization sequentially, the returned interference signals from both principal states of polarization being used separately in the said process for determining the absolute optical path length for each propagation mode independent of the other mode (col. 1, lines 48-52) where to measure polarization correctly polarization-maintaining is an obvious requirement of a fiber, and where measuring the optical path length is a basic function of an interferometer.

As to claim 6, Prohaska discloses a method in which the selected parameter comprises temperature (col. 3, lines 20-24) where being able to measuring multiple parameter types is an obvious benefit to any device.

As to claim 10, Prohaska discloses, a method in which the selected parameter comprises strain (col. 13, lines 16-19) where being able to measuring multiple parameter types is an obvious benefit to any device.

As to claim 11, Prohaska discloses a method where the optical fiber is a high-birefringence fiber, the birefringence of which changes in response to strain applied to the optical fiber (col. 2, lines 12-15) where measuring strain with birefringence fiber is an obvious modification of the fiber optics system.

As to claim 12, Prohaska discloses a method where the birefringence of the high-birefringence fiber also changes in response to temperature, and the method further comprises compensating the returned optical interference signal for effects arising from temperature at the said location (col. 3, lines 28-31) where compensating for

temperature changes is a liquid is an obvious benefit when trying to acquire accurate results.

As to claim 14, Prohaska discloses a method in which the selected parameter comprises pressure (col. 1, lines 53-57) where being able to measuring multiple parameter types is an obvious benefit to any device.

As to claim 15, Prohaska discloses a method where the said optical fiber comprises a side-hole fiber (Abstract, lines 15-20) where measuring pressure accurately requires a hole in the side of the fiber to allow liquid to flow near the fiber.

As to claim 16, Prohaska discloses a method where each sensor element of the fiber is located within a sealed elliptical tube filled with a pressure-transmitting fluid (col. 3, lines 2-4) where geometric shape can be varied to allow better sensitivity or strength.

As to claim 19, Prohaska discloses a method where the selected parameter depends on a localized event moving along the region of interest, and the method comprises determining the value of the selected parameter over time at more than one said location, and determining the movement of the localized event from the determined values of the selected parameter (col. 4, lines 66-67; col. 5, lines 1-16) where taking direct measurements near the event in question and using that specific parameter to determine movement in the fiber would be the most efficient use of an interferometric system.

As to claim 20, Prohaska discloses A method where the localized event is a user-induced event (i.e. where the user taking readings off the detectors is local), and the method further comprises inducing the localized event (col. 4, lines 66-67; col. 5, lines

1-16) where taking measurements near the event in question would be the most efficient use of an interferometric system.

As to claim 21, Prohaska discloses a method as where the localized event is a volume of fluid within the region of interest that has a different temperature, pressure, or density (i.e. where density can be attained from pressure reading) from surrounding fluid in the region of interest, the selected parameter being temperature, pressure, or density, respectively (col. 5, lines 10-13) where allowing multiple parameters to be measured within fluid would be an obvious benefit to a sensor.

As to claim 26, Prohaska discloses a method where the measured value for the parameter is used to determine the value for a further measured dependent upon the said parameter and where the said optical fiber is provided with a coating which responds to the said further measured by stretching or shrinking (col. 8, lines 3-9) where using a measured value to gain further information has obvious benefits to efficiency.

As to claim 28, Prohaska discloses a method where the said coating is electro-astrictive (col. 9, lines 60-64) where allowing a coating to be of different types gives the obvious ability of more versatility in measuring.

As to claim 29, Prohaska discloses a method where the said coating is magneto-astrictive (col. 9, lines 60-64) where allowing a coating to be of different types gives the obvious ability of more versatility in measuring.

As to claim 30, Prohaska discloses a method where the said coating is sensitive to a selected chemical measured (col. 6, lines 45-48) where allowing a coating to be of different types gives the obvious ability of more versatility in measuring.

As to claim 36, Prohaska discloses a method where the region of interest lies within an oil well (i.e. where fluid in reference could be an oil well or any liquid) (col. 3, lines 2-4) where allowing the sensor to measure in a specific fluid gives more measuring versatility.

As to claim 43, Prohaska discloses an apparatus where the said optical fiber comprises polarisation-maintaining fiber, and the apparatus further comprises a polarization modulator operable to launch the optical pulses into the fiber in such a way that the power of the optical pulses is firstly directed entirely into one of the principal states of polarization of the fiber and then the other, thereby to interrogate the principal states of polarization sequentially; and the signal processing means being operable to use the returned optical interference signals from both principal states of polarization separately to determine the absolute optical path length for each propagation mode independent of the other mode (col. 1, lines 48-52) where to measure polarization correctly polarization-maintaining is an obvious requirement of a fiber, and where measuring the optical path length is a basic function of an interferometer.

As to claim 44, Prohaska discloses an apparatus where the parameter comprises temperature (col. 3, lines 20-24) where being able to measuring multiple parameter types is an obvious benefit to any device.

As to claim 48, Prohaska discloses an apparatus where the parameter comprises strain (col. 3, lines 20-24) where being able to measuring multiple parameter types is an obvious benefit to any device.

As to claim 49, Prohaska discloses an apparatus where the optical fiber is a high-birefringence fiber, the birefringence of which changes in response to strain applied to the optical fiber (col. 2, lines 12-15) where measuring strain with birefringence fiber is an obvious modification of the fiber optics system.

As to claim 50, Prohaska discloses an apparatus where the birefringence of the high birefringence fiber also changes in response to temperature, and the signal processing means is further operable to compensate the returned optical interference signal for effects arising from temperature at the said location (col. 3, lines 28-31) where compensating for temperature changes is a liquid is an obvious benefit when trying to acquire accurate results.

As to claim 52, Prohaska discloses an apparatus where the parameter comprises pressure (col. 1, lines 53-57) where being able to measuring multiple parameter types is an obvious benefit to any device.

As to claim 53, Prohaska discloses an apparatus where the said optical fiber comprises a side-hole fiber (Abstract, lines 15-20) where measuring pressure accurately requires a hole in the side of the fiber to allow liquid to flow near the fiber.

As to claim 54, Prohaska discloses an apparatus where each sensor element of the fiber is located within a sealed elliptical tube filled with a pressure-transmitting fluid (col. 3, lines 2-4) where geometric shape can be varied to allow better sensitivity or strength.

As to claim 57, Prohaska discloses an apparatus where the selected parameter depends on a localized event moving along the region of interest, and the signal

processing means is operable to determine the value of the selected parameter over time at more than one said location, and to determine the movement of the localized event from the determined values of the selected parameter (col. 4, lines 66-67; col. 5, lines 1-16) where taking direct measurements near the event in question and using that specific parameter to determine movement in the fiber would be the most efficient use of an interferometric system.

As to claim 58, Prohaska discloses an apparatus where the localized event is a user-induced event (i.e. where the user taking readings off the detectors is local) (col. 4, lines 66-67; col. 5, lines 1-16) where taking measurements near the event in question would be the most efficient use of an interferometric system.

As to claim 59, Prohaska discloses an apparatus where the localized event is a volume of fluid within the region of interest that has a different temperature, pressure, or density (i.e. where density can be attained from pressure reading) from surrounding fluid in the region of interest, the selected parameter being temperature, pressure, or density, respectively (col. 5, lines 10-13) where allowing multiple parameters to be measured within fluid would be an obvious benefit to a sensor.

As to claim 60, Prohaska discloses an apparatus further for measuring a second selected physical parameter at the location within the region of interest, where said optical path length between the said reflectors is further dependent upon the second selected parameter; and the signal processing means is further operable to determine the value of the second selected physical parameter from the determined absolute

optical path length (col. 5, lines 41-46; col. 9, lines 32-40; Fig. 1) where determining two separate parameters allows for a more flexible sensor.

As to claim 64, Prohaska discloses an apparatus operable to use the measured value for the parameter to determine a value for a further measured dependent upon said parameter, and where the said optical fiber is provided with a coating which responds to the said further measured by stretching or shrinking (col. 8, lines 3-9) where using a measured value to gain further information has obvious benefits to efficiency.

As to claim 66, Prohaska discloses an apparatus where the said coating is electro-astrictive (col. 9, lines 60-64) where allowing a coating to be of different types gives the obvious ability of more versatility in measuring.

As to claim 67, Prohaska discloses an apparatus where the said coating is magneto-astrictive (col. 9, lines 60-64) where allowing a coating to be of different types gives the obvious ability of more versatility in measuring.

As to claim 68, Prohaska discloses an apparatus where the coating is designed to be sensitive to a selected chemical measured (col. 9, lines 60-64) where allowing a coating to be of different types gives the obvious ability of more versatility in measuring.

As to claim 69, Prohaska discloses an apparatus where the source means are operable to launch light at a fixed wavelength (i.e. wavelengths launched are fixed and can also be varied) and at a varying wavelength into the fiber, and the signal processing means are operable to use the interference signal from interrogation at the fixed wavelength to determine high frequency phase changes (col. 5, lines 4-8) where

allowing the source to provide multiple or fixed wavelengths allows more point to be analyzed along the fiber.

As to claim 72, Prohaska discloses an apparatus where the signal processing means are further operable to use the high frequency (i.e. where freq in ref is variable so can be high or low) phase changes to correct for dynamic errors in the returned optical interference signals (col. 12, lines 40-46) where analyzing dynamically the changing wavelength is a beneficial process in any interferometric apparatus.

As to claim 74, Prohaska discloses an apparatus where the region of interest lies within an oil well (i.e. where fluid in reference could be an oil well or any liquid) (col. 3, lines 2-4) where allowing the sensor to measure in a specific fluid gives more measuring versatility.

Given the teaching of Prohaska, a person having ordinary skill in the art at the time of the invention would have readily recognized the desirability and advantages of modifying Waagaard by employing the well-known features of interferometric systems. It is widely known in the art that allowing an interferometer to measure multiple different types of parameters such as pressure or temperature would give a machine much more versatility in the field. Thus making it a much more efficient device to produce and use for multiple measurements in a fluidic environment.

2. As to claims 4, 22, 42 although Waagaard in view of Prohaska doesn't expressly teach an interferometric system where principal states of polarization can be interrogated simultaneously it would have been obvious because a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If

this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense (col. 3, lines 7-12; col. 8, lines 26-33) where one of ordinary skill in the art would know that having two different sensing parameters could be measured not only sequentially but also simultaneously to gain predictable separate results.

As to claim 70, Waagaard does not explicitly disclose, an apparatus further comprising an auxiliary optical fiber for deployment through the region of interest, reflectors being arrayed along the fiber to form an auxiliary array of sensor elements, the source means being operable to launch the fixed wavelength signal into the auxiliary fiber.

However, Waagaard does disclose and show in figure 1 and in (col. 1, lines 58-67; col. 2, lines 57-62; col. 3, lines 50-56) where each light pulse since controlled by controller 108 sends each pulse at a defined fixed wavelength for proper reflection off the reflectors. Further it would have been obvious to one having ordinary skill in the art at the time the invention was made to add additional auxiliary sensor elements, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. St. Regis Paper Co. v. Bemis Co., 193 USPQ 8.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Waagaard with an additional array of reflectors for further detailed information of the device under test.

3. Claim 71 is rejected under 35 U.S.C. 103(a) as being unpatentable over Waagaard in view of Prohaska further in view of Hodgson et al. (U.S. Patent No. 6,269,198 and Hodgson hereinafter).

As to claim 71, Waagaard in view of Prohaska does not explicitly disclose where an apparatus where the auxiliary fiber has a coating designed to enhance acoustic sensitivity.

However, Hodgson does disclose in (col. 2, lines 12-16) an apparatus where the auxiliary fiber has a coating designed to enhance acoustic sensitivity.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Waagaard in view of Prohaska to provide the advantage of an additional parameter that could be measured for further detailed analysis of the device under test.

Response to Arguments

12. Applicant's arguments with respect to claim 1,39, and 70-71 have been considered but are moot in view of the new ground(s) of rejection.

13. Applicant's arguments with respect to claim 4-6, 10-12, 14-16, 19-22, 26, 28-30, 36, 42-44, 48-50, 52-54, 57-59, 60, 64, 66-69, 72 and 74 have been considered but are moot in view of the new ground(s) of rejection. The deficiencies of Kersey are now met by Waagaard therefore the arguments with respect to the claims mentioned are moot, since applicant only argued against the deficiencies of the primary reference Kersey.

Allowable Subject Matter

14. Claims 2 and 40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

As to claim claims 2, and 40, the prior arts of record taken alone or in combination with any other references fail to teach or suggest the claimed method or apparatus where the step of determining the absolute optical path length comprises carrying out a process in which the **derivative of the phase as a function of wavelength** is estimated from a subset of the interference signals, using the derivative and an estimated value for the optical path length to estimate the phase relationship between the interference signals, and the phase relationship thus obtained is used to revise the estimated value for the optical path length, the process being repeated for increasing subsets of the remaining wavelengths in sequence, on the basis of the optical path length estimated for the immediately preceding subset in the sequence, **thereby to progressively revise the optical path length until it is known to a desired level of accuracy**

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Prior Art made of Record

15. The prior art made of record and not relied upon is considered pertinent to applicants disclosure.

a. Farhadiroushan (U.S. Patent No. 6,285,446 B1) discloses a similar system that detects a selected parameter by detecting change in optical path length (col. 1, lines 24-29), further the system similarly measures the optical path length between each reflector as shown in figure 1.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL LAPAGE whose telephone number is (571)270-3833. The examiner can normally be reached on Monday Through Friday 7:30AM-5:00PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tarifur Chowdhury can be reached on 571-272-2287. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Michael LaPage/
Examiner, Art Unit 2886

/TARIFUR R CHOWDHURY/
Supervisory Patent Examiner, Art Unit 2886